(12) UK Patent Application (19) GB (11) 2 326 286 (13) A

(43) Date of A Publication 16.12.1998

(21) Application No 9808703.4

(22) Date of Filing 24.04.1998

(30) Priority Data
(31) 97015761 (32) 26.04.1997 (33) KR

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(51) INT CL^6
H01P 5/12 , H03H 7/48

(52) UK CL (Edition P)
H1W WCX W2 W38 W7
H3U UQX U10A

(56) Documents Cited
GB 2204186 A GB 2158295 A US 5469129 A

(58) Field of Search
UK CL (Edition P) H1W WBA WBX WCX , H3U UQX
INT CL^6 H01P 5/04 5/12 , H03H 7/00 7/46 7/48
Online: WPI, JAPIO, CLAIMS

(54) Abstract Title
RF Power divider

(57) A Wilkinson RF power divider or combiner, in which λ/4 lines are formed by inductor coils and the capacitors, being lumped elements, instead of being transmission lines. One embodiment includes a single input port IP1; first and second output ports OP1 OP2; a input transmission line 10 coupled to the input port; first and second coils 22, 24 coupled to an output side of the input transmission line; a first output transmission line 12 coupled between an output side of the first coil and the first output port; a second output transmission line 14 coupled between the output side of the first coil and the second output port; a first capacitor 34 coupled between a ground and a point of connection of the input transmission line with the first and second coils; a resistor 16 coupled between a point of connection of the first coil with the first output transmission line, and a point of connection of the second coil with the second output transmission line; and a second capacitor 36 coupled to the resistor in parallel. Such an RF power divider or combiner is of use in a UHF-band high-power amplifier of a radio transmitter.

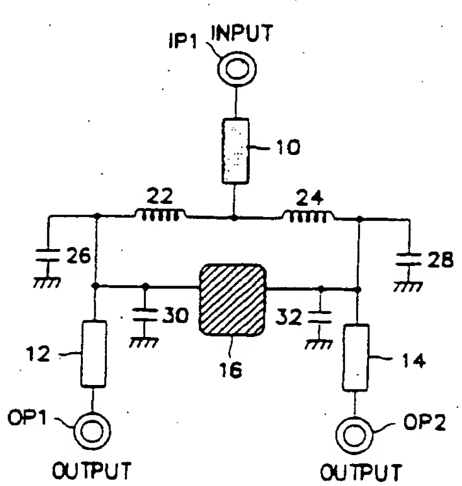

FIG. 4

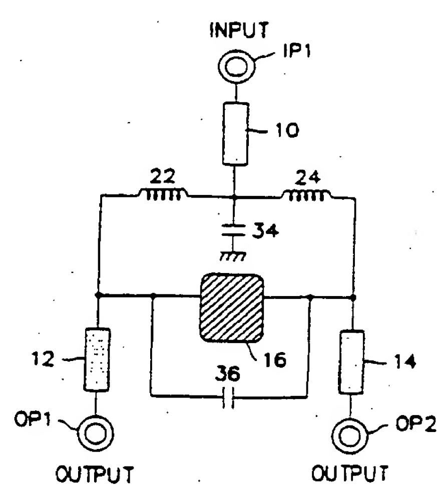

FIG. 6

The reference to Figure 7A of the drawings in the printed specification is to be treated as omitted under Section 15(2) or (3) of the Patents Act 1977.
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.
This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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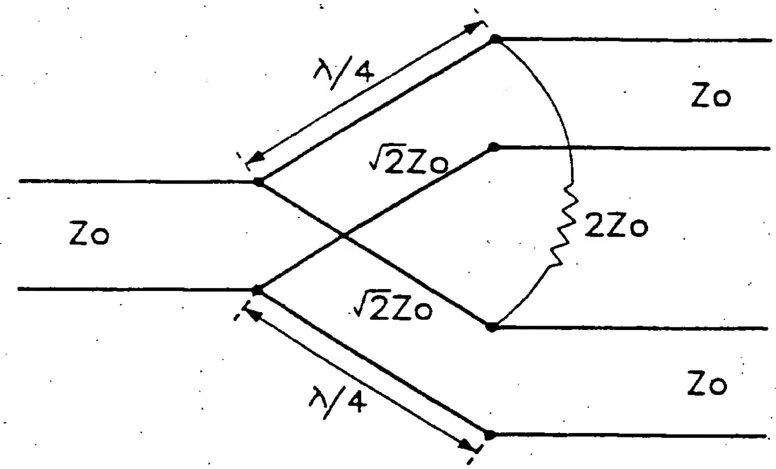

FIG. 1

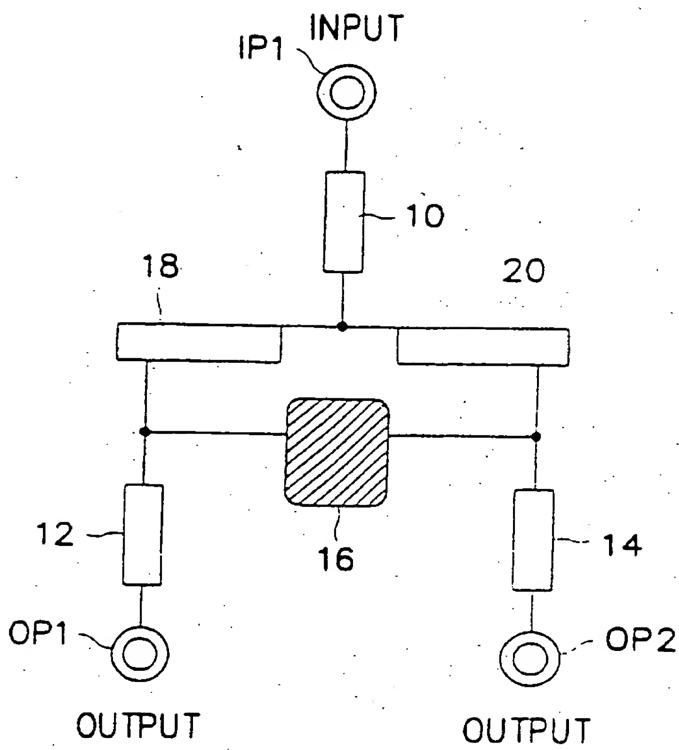

FIG. 2

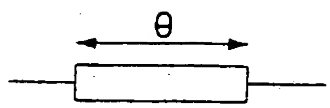

FIG. 3A

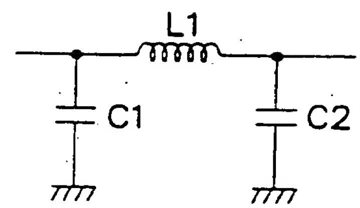

FIG. 3B

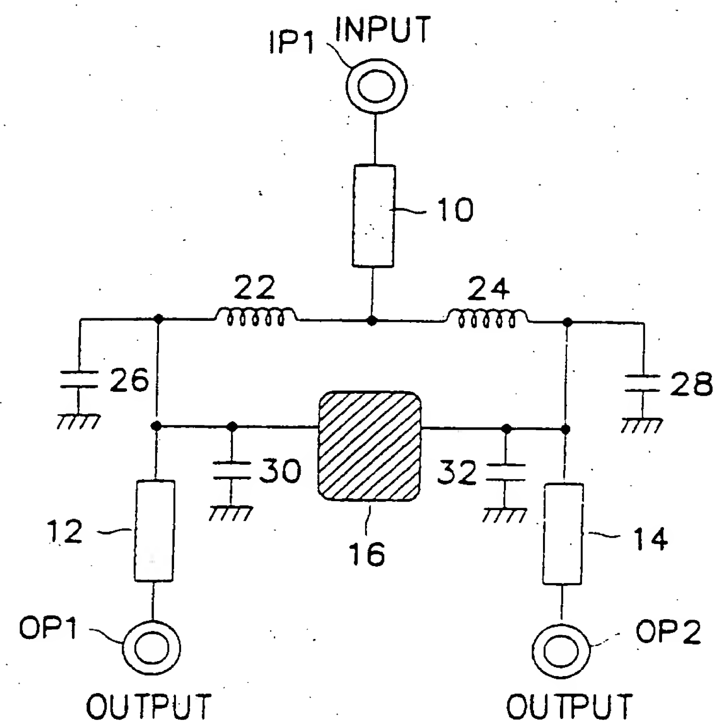

FIG. 4

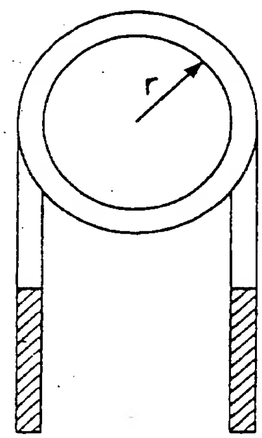

FIG. 5A

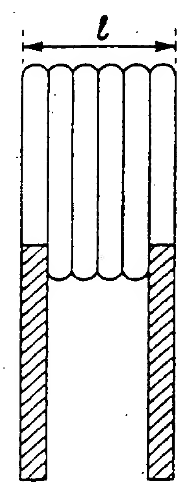

FIG. 5B

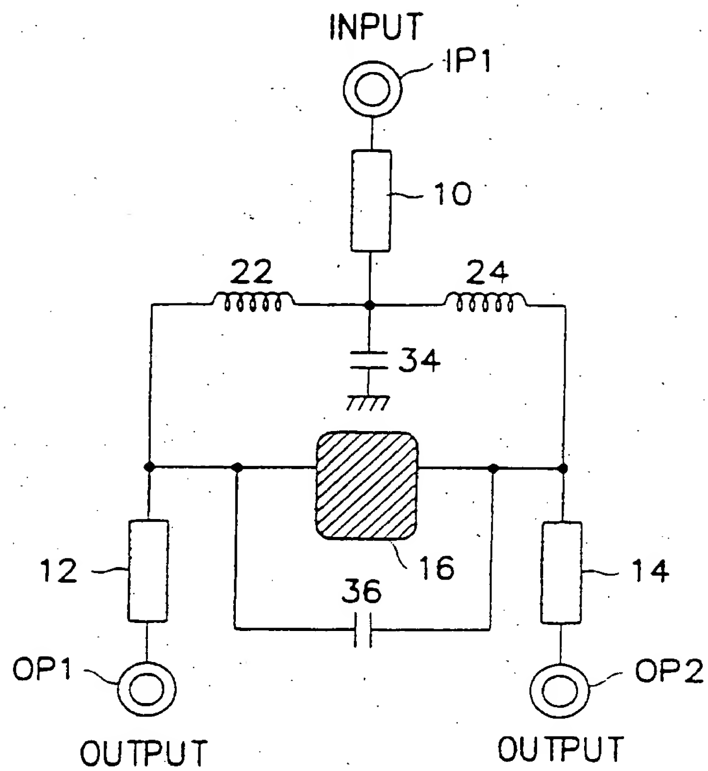

FIG. 6

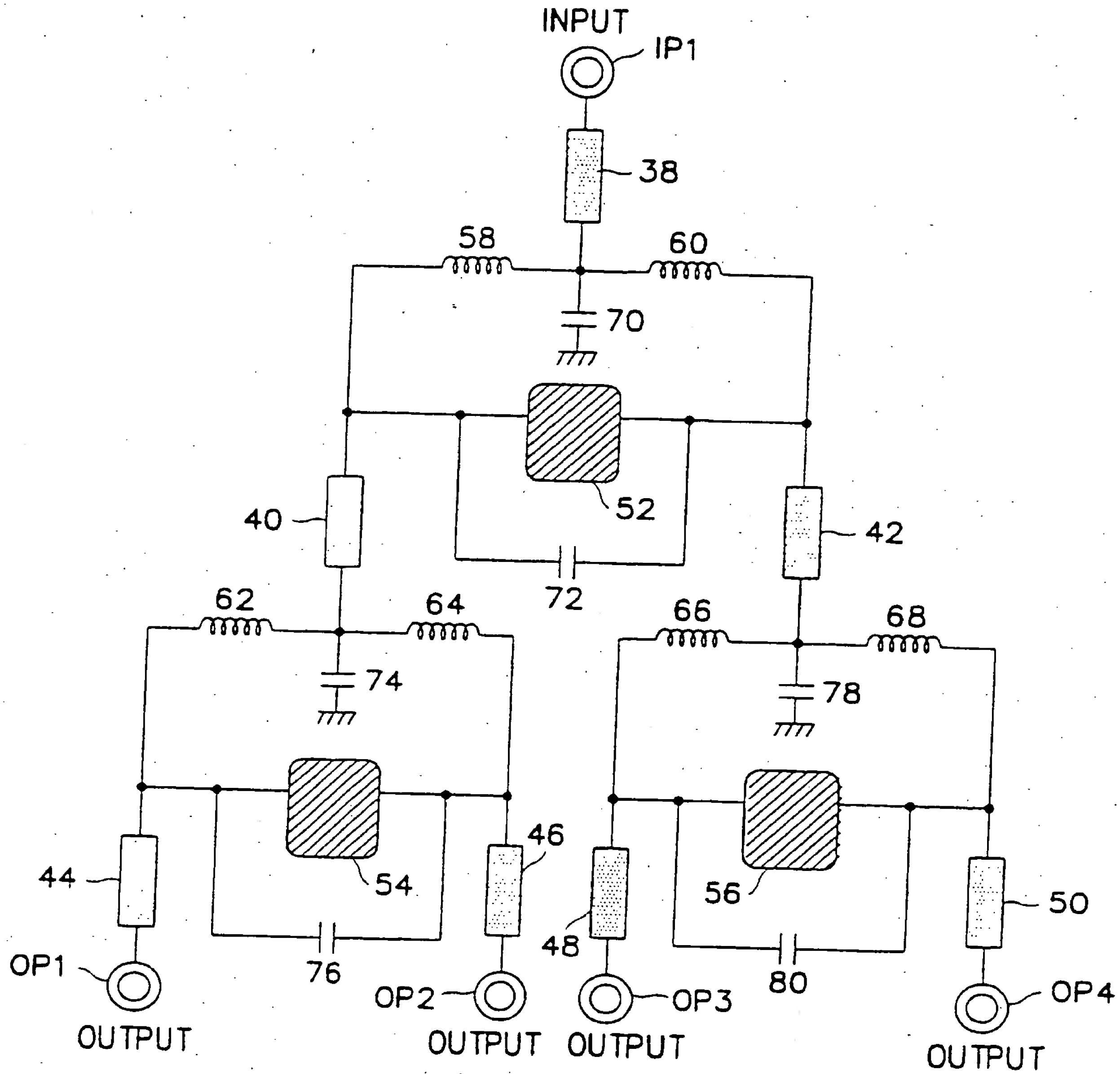
INPUT
IP1
38
58
60
70
52
40
42
72
62
64
66
68
74
78
54
56
44
46
48
50
76
80
OP1
OP2
OP3
OP4
OUTPUT
OUTPUT
OUTPUT
OUTPUT

FIG. 7

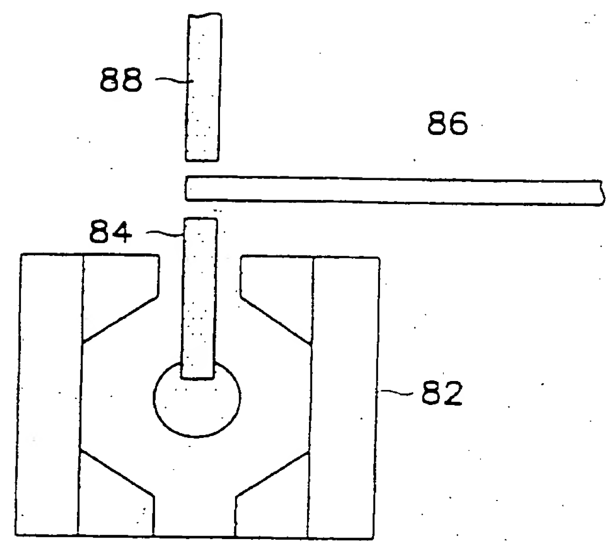

FIG. 8

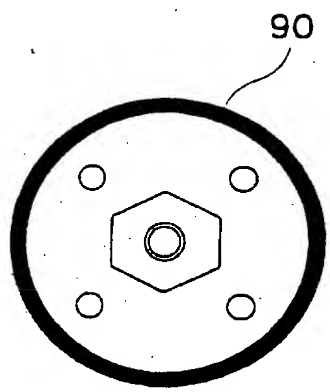

FIG. 9

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RF POWER DIVIDER

BACKGROUND TO THE INVENTION

The present invention relates to an RF (Radio Frequency) power divider and in particular to a Wilkinson power divider, such as may be used in a UHF (Ultra High Frequency) band high power amplifier in a radio transmitter.

As various high-quality radio paging services are provided, repair and management have emerged as significant issues to service providers. Particularly, the number of radio paging transmitters required for transmitting a signal in an air path increases in proportion to the ever increasing number of radio pager subscribers. However, the service providers cannot limitlessly increase radio paging transmitter equipment, let alone personnel and subsidiary installations.

The increasing number of subscribers could be provided with the required services using only the present level of personnel, and established radio paging equipment and subsidiary installations, provided that many signals required for transmission may be concurrently transmitted at high speed, and that present transmitters may be adapted to transmit over increasing distances. Accordingly, there is an ever pressing need for high-power RF amplifiers, to enable transmission of radio signals over a wider area.

Most high-power amplifiers obtain high output power by combining a plurality of RF amplifying devices (each having limited output power) in parallel.

A device for dividing or combining radio signals is called an RF power divider or combiner. RF power dividers are categorised into a T-junction power divider, a Wilkinson power divider, and quadrature hybrid power divider. They are selectively used in accordance with their particular characteristics. These RF power dividers are used in radio

transmitters such as the aforementioned radio paging transmitters. Among them, the Wilkinson power divider is widely used in UHF-band radio transmitters, and is basically constituted in terms of transmission lines as shown in figure 1.

Figure 1 illustrates an equal split ratio Wilkinson power divider for dividing an input signal into two equal output signals. Here, the output signals are equal in phase to, and 3dB smaller in magnitude than, the input signal.

The known Wilkinson power divider of figure 1 is implemented with transmission lines, such as coaxial lines, or microstrip lines on a substrate, having suitable impedances, such as shown in figure 2. The RF power divider of figure 2 has a single input port IP1, first and second output ports OP1 and OP2. A microstrip line 10 is coupled to the input port IP1, two microstrip lines 18 and 12 are serially coupled between an output side of the microstrip line 10 and the first output port OP2. Assuming that a system impedance is Z_o, the respective impedances of the microstrip lines 10, 12 and 14 are Z_o, as shown in figure 1. The impedance of each the microstrip lines 18 and 20 which act as quarter wavelength ($\lambda/4$) lines is $\sqrt{2}Z_o$. In addition, a resistor 16 is coupled between the points of connection of the microstrip lines 18 and 12, and of the microstrip lines 20 and 14. The resistance of the resistor 16 is $2Z_o$, as shown in figure 1.

When the $\lambda/4$ lines are implemented with microstrip lines, coaxial lines or other transmission lines as described above, the length of the $\lambda/4$ lines 18, 20 corresponds to a quarter wavelength ($\lambda/4$) of a frequency band for which the power divider is designed. Such length is significant if the frequency band is a UHF band. For example, a $\lambda/4$ transmission line for 325MHz radio is about 23cm long.

Therefore, when $\lambda/4$ lines are implemented with microstrip lines, coaxial lines or similar transmission lines, an RF power divider occupies a large portion of a given amplifier area, imposing spatial constraints on amplifier circuits. Further, the $\lambda/4$ transmission lines, whose length is set in accordance with a frequency band used, cannot be adapted to compensate against external condition changes such as frequency variation. Thus, the RF power divider must be reconstructed according to the changed external condition in order to obtain intended electrical properties.

To measure an output signal, measurement terminals of a measuring instrument should be connected to input and output ports IP1, OP1, OP2. In known RF power dividers, the measurement terminals are directly soldered to the input and output ports.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a smaller RF power divider.

Another object of the present invention is to provide an RF power divider having characteristics variably adjustable according to changes in external conditions.

Still another object of the present invention is to provide an RF power divider which facilitates measurement of an output signal.

Accordingly, the invention provides an RF power divider comprising an input transmission line having input and output ends; first and second quarter wavelength ($\lambda/4$) lines each having an input end connected to the output end of the input transmission line, and an output end; first and second output transmission lines each having an output end, and an input end connected to the output end of a respective one of first and second quarter wavelength lines; and a resistor coupled

between the respective input ends of the first and second output transmission lines. Advantageously, the quarter wavelength lines are composed of inductor coils and capacitors, being lumped elements.

According to an embodiment of the invention, the quarter wavelength lines comprise first and second inductor coils, each respectively coupled between the output side of the first microstrip line, and the input side of a respective one of first and second output transmission lines; a first capacitor coupled between a ground and the output side of the input microstrip line; and a second capacitor coupled in parallel with the resistor.

According to an embodiment of the invention, the quarter wavelength lines comprise first and second inductor coils, each having an input side coupled to the output side of the input transmission line, and an output side coupled to the input side of a respective one of first and second output transmission lines; a first capacitor coupled between a ground and the output side of the first coil; a second capacitor coupled between the ground and the output side of the second coil; a third capacitor coupled between the ground and the input side of the first output transmission line; and a fourth capacitor coupled between the ground and the input side of the second output transmission line.

According to an embodiment of the invention, a four-output RF power divider comprises three RF power dividers as discussed above, wherein first and second outputs of first RF power divider are each connected to an input of respective one of second and third RF power dividers.

More generally, the invention provides multiple-output RF power dividers comprising at least two RF power dividers as discussed above.

According to an embodiment of the invention, such four-output or multiple-output RF power dividers may comprise a first single transmission line performing the combined functions of the first output transmission line of the first RF power divider and the input transmission line of the second RF power divider; and a second single transmission line performing the combined functions of second output transmission line of the first RF power divider and the input transmission line of the third RF power divider.

The coils may be air-cored coils. They are preferably adjustable.

The transmission lines may be microstrip lines.

The transmission lines may be coaxial lines.

An RF power divider of the invention may further comprise an input port connected to the input side of the input transmission line, and output ports (OP1-OP4) connected to output sides of respective output transmission lines.

An RF power divider of the invention may further comprise measuring connectors for connecting measurement terminals of a measuring instrument.

A silk may be marked on a rear soldered surface of each measuring connector. Such silk preferably comprises a circle positioned so as to be centred on a connecting portion of a connected measurement terminal.

The invention also provides a UHF band high power amplifier incorporating an RF power divider As discussed above.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described by way of example with reference to the accompanying drawings in which:

figure 1 is a circuit diagram of a general Wilkinson power divider, expressed in transmission lines;

figure 2 is a schematic view of the Wilkinson power divider shown in figure 1, which is implemented with microstrip lines;

figures 3A and 3B represent a microstrip line and its concentrated integer equivalent circuit;

figure 4 is a schematic view of an RF power divider using lumped elements according to a first embodiment of the present invention;

figures 5A and 5B illustrate the shape of coils shown in figure 4;

figure 6 is a schematic view of an RF power divider according to a second embodiment of the invention;

figure 7 is a schematic view of a four-output RF power divider according to a third embodiment of the invention;

figure 7A shows a four-output RF power divider according to a fourth embodiment of the invention;

figure 8 illustrates patterns of a measuring connector according to an aspect of the present invention; and

figure 9 is a view of silk marking on the rear surface of the measuring connector shown in figure 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

It has been found that microstrip lines may be modelled in a concentrated integer equivalent circuit implemented with lumped elements. That is, a single microstrip line as shown in figure 3A can be implemented in an equivalent circuit with a single coil L1 and two capacitors C1 and C2 as shown in figure 3B. In figure 3A, θ represents the length of the microstrip, expressed as a phase angle of a designed operational frequency. For a $\lambda/4$ line, θ must correspond to one quarter wavelength, that is 90°.

According to an aspect of the invention, the $\lambda/4$ lines in a Wilkinson power divider are constituted of lumped elements.

Figure 4 is a schematic view of an RF power divider according to a first embodiment of the present invention. Like reference numerals denote like components with reference to figure 2. Here, a Wilkinson power divider has $\lambda/4$ transmission lines implemented with lumped elements, that is, inductance coils and capacitors. An inductance coil 22 and the microstrip line 12 are serially coupled between the output side of the microstrip line 10 and the first output port OP1. An inductance coil 24 and the microstrip line 14 are serially coupled between the output side of the microstrip line 10 and the second output port OP2. Assuming that a system impedance is Z_o, the respective impedances of the microstrip lines 10, 12, and 14 are Z_o, as shown in figure 1. The resistor 16 is coupled between the point of connection of the coil 22 with the microstrip line 12, and the point of connection of the coil 24 with the microstrip line 14. The resistance of the resistor 16 is $2Z_o$, as shown in figure 1. In addition, a capacitor 26 is coupled between the point of connection of the coil 22 with the microstrip line 12, and a ground; and a capacitor 28 is coupled between the point of connection of the coil 24 with the microstrip line 14, and the ground. A capacitor 30 is coupled between the point of connection of the microstrip line 12 with the resistor 16, and the ground; and a capacitor 32 is coupled between the point of connection of the microstrip line 14 with the resistor 16, and the ground.

The coil 22 and the capacitors 26 and 30 in figure 4 perform the function of the microstrip line 18 of figure 2. The coil 24 and the capacitors 28 and 32 perform the function of the microstrip line 20 of figure 2. Values of the inductance of the coils 22 and 24, and capacitance of the capacitors 26, 28, 30, 32 as used in an actual RF power divider circuit are given in the following example.

It is assumed that the frequency band used in the RF power

divider shown in figure 4 is 322-328.6MHz; its central frequency is 325MHz; and the system impedance Z_o is 50Ω. Referring to figures 3A and 3B, if the microstrip line of figure 3A is a $\lambda/4$ transmission line (so that $\theta = 90°$), and has an impedance Z_1, values of a reactance X generated by the coil L1 of figure 3B, and a reactance B generated by capacitors C1 and C2 of figure 3B are given by

$$X = Z_1 \sin\theta = \omega L$$

$$B = \frac{1}{Z_1} \tan\frac{\theta}{2} = \omega Ct \quad \ldots\ldots (1)$$

where L is the inductance of coil L1, Ct is the total capacitance of capacitors C1 and C2 and ω is the angular frequency of the applied signal. Because Z_1 is $\sqrt{2}Z_o$ as shown in figure 1 and θ is 90°, equations (1) can be expressed as

$$\sqrt{2}Z_o \sin 90° = \omega L$$

$$\frac{\tan(90°/2)}{\sqrt{2}Z_o} = \omega Ct \quad \ldots\ldots (2)$$

Because the central frequency is 325MHz, equations (2) are developed with respect to the inductance L and the capacitance Ct, as

$$L = \frac{\sqrt{2}\times 50}{2\pi\times 325\times 10^6} = 34.64\text{nH}$$

$$Ct = \frac{1}{\sqrt{2}\times 50\times 2\pi\times 325\times 10^6} = 6.93\text{pF} \quad \ldots\ldots (3)$$

Therefore, if the RF power divider of figure 4 is to be used at 325MHz, the coils 22 and 24 should each have an inductance

of 34.63nH, and the capacitors 26 and 28 should have a total combined capacitance of 6.93pF, as should the capacitors 30, 32.

The inductance coils 22 and 24 may be air-cored coils as shown in figures 5A and 5B. Figures 5A and 5B are side and frontal views respectively of the coils 22 and 24. Assuming that the radius of the coils 22 and 24 is r, winding length is l, and the number of windings is N, the inductance L is calculated by

$$L = \frac{r^2N^2}{9r+10l}$$

The required number of turns may then be calculated as:

$$N = \sqrt{(L(9r+10l)/r^2)} \quad .....(4)$$

The interval of a coil is the distance between corresponding locations in adjacent windings. As shown in figure 5B, the minimum interval is equal to the diameter of the wire used.

According to a second embodiment of the invention, as shown in figure 6, capacitors 26 and 28 may be combined into one single capacitor having a capacitance equal to the parallel combination of the capacitors 26, 28; that is 2C if capacitors 26, 28 are of equal value C. Capacitors 30 and 32 may also be combined into another single capacitor having a capacitance equal to the series combination of the capacitors 30, 32; that is C/2. The capacitor 34 is coupled between the point of connection of the microstrip line 10 with the coils 22 and 24, and the ground; and the capacitor 36 is coupled in parallel with the resistor 16.

This second embodiment is advantageous in that it has a reduced number of components, and in that it is easier to dissipate heat generated during power combination and

division to a heat sink through a PCB (Printed Circuit Board) carrying the RF power divider of the present invention.

Circuit simulation allows optimal component values and circuit configuration to be deduced before a circuit is physically assembled. Simulation of the RF power divider shown in figure 6 by a Touchstone simulator yielded the results described below.

In the simulation, the inductance of the air-cored coils 22 and 24, and the capacitances of the capacitors 34 and 36 were calculated as 32.6nH, 10.42pF, and 0.747pF, respectively. The capacitances of the capacitors 34 and 36 actually used were 10pF, and 0.7pF, respectively, using porcelain capacitors.

The inductance of the coils 22 and 24 can be obtained by equation (4), and should be adjusted using a network analyser after their manufacture. The coils 22 and 24 may be formed by winding a 1.2mm diameter enamel line around a 4mm diameter forming bar three times and tuned with reference to a measuring instrument to have an inductance of 32nH, before being integrated on the PCB carrying the RF power divider circuit.

An actual PCB pattern was designed by a CAD (Computer Aided Design) tool, that is a wave maker, on the basis of data estimated by the Touchstone simulator. A polytetrafluoroethene ("Teflon" TM) PCB substrate having a dielectric constant ε_r of 2.5, widely used in the manufacture of RF circuits, was employed in the construction of an RF power divider according to the present invention. The capacitors 36 and 38 used were high-Q porcelain capacitors manufactured by American Technical Ceramic.

A third embodiment of the RF power divider of the invention is shown in figure 7. This embodiment is a four-output RF power divider having a single input port IP1 and four output

ports OP1-OP4. It can be obtained by combining three RF power dividers such as shown in figure 6.

Conceptually, a first two-output RF power divider has two output ports, each connected to an input of one of second and third two-output RF power dividers.

The first RF power divider comprises microstrip line 38; coils 58, 60; capacitor 70; resistor 52; capacitor 72; microstrip line 40; and microstrip line 42. The second RF power divider comprises microstrip line 40; coils 62, 64; capacitor 74; resistor 54; capacitor 76; microstrip line 44; and microstrip line 46. The third RF power divider comprises microstrip line 42; coils 66, 68; capacitor 78; resistor 56; capacitor 80; microstrip line 48; and microstrip line 50. Input port IP1 is connected to microstrip 38, output ports OP1, OP2, OP3, OP4 are respectively connected to microstrip lines 44, 46, 48, 50.

Microstrip line 40 performs the combined functions of first output microstrip line (12 in figure 6) of the first RF power divider, and input microstrip line (10 in figure 6) of the second RF power divider. Microstrip line 42 performs the combined functions of second output microstrip line (14 in figure 6) of the first RF power divider and input microstrip line (10 in figure 6) of the third RF power divider.

In figure 7, a signal input to the input port IP1 is divided into four signals, output to the first to fourth output ports OP1-OP4. Each output signal is attenuated by 6dB with respect to the input signal, and has the same phase as that of the input signal. The signal attenuation in a corresponding frequency band, and degrees of isolation between output ports OP1-OP4 are determined by adjusting the intervals of the coils 56-68. By adjusting the intervals of coils 58-68, their inductance values are modified, and electrical characteristics of the RF divider may thereby be modified so

as to compensate for changes in external conditions such as frequency variation. The coils 58-68 serve as variable adjustment points.

The RF power divider is thereby adjusted for the required frequency band. The four divided signals, which are attenuated by 6dB from an original signal and have the same phase as that of the original signal, become input signals of high-power amplifiers in following stages, not shown in the drawings.

A further, fourth embodiment of the present invention may be realised by combining three two-output RF dividers such as shown in figure 4 to provide a four-output divider as shown in figure 7A. The three two-output dividers may be combined in a manner analogous to that shown in figure 7. A single microstrip line may perform the combined functions of first output microstrip line (12 in figure 4) of the first RF power divider and input microstrip line (10 in figure 4) of the second RF power divider. A second single microstrip line may perform the combined functions of second output microstrip line (14 in figure 4) of the first RF power divider and input microstrip line (10 in figure 4) of the third RF power divider.

Other circuit configurations are possible, combining various numbers of two-input dividers, to produce RF power dividers with six, eight or more outputs.

Figure 8 is a magnified view of PCB patterns 82, 84 which allow connection of a measuring connector, such as may be integrated onto the PCB to connect measurement terminals of a measuring instrument to each of the input port IP1 and the first and second output ports OP1 and OP2 of the circuits of figure 4 and figure 6, or the input port IP1, the first to fourth output ports OP1-OP4, and output ends of the microstrip lines 40 and 42 of the circuit of figure 7. Line

86 is an output line of an RF power divider in a previous stage, and line 88 is an input line of an RF power divider in a next stage. Therefore, a signal can be measured by inserting a measurement terminal into a measuring connector connected to the measuring connector patterns 82 and 84, and positioning a capacitor, such as a porcelain capacitor, between the pattern 84 and the line 86. By placing the capacitor between the lines 86 and 88, the signal is transmitted to the next stage. By positioning a first porcelain capacitor between the pattern 84 and the line 86, while a second porcelain capacitor is positioned between the lines 86 and 88 as an input path to the next stage, the signal at the measuring connector is attenuated by 3dB and is also transmitted to the next stage, attenuated by 3dB. Accordingly, signals can be measured without soldering the measurement terminals to the input and output ports.

When a measuring connector is soldered to the PCB, the surface of the PCB around the connector may be rugged due to excess solder dropped on a soldered surface, thereby impeding tight contact between a heat sink of a high-power amplifier and the substrate. As a result, RF ground effect cannot be obtained.

Figure 9 shows a pattern of a silk 90 which may be marked on the soldered rear surface of the PCB having the measuring connector patterns 82 and 84. The silk 90, including a circle enclosing a part of the PCB surface prevents introduction of excess solder onto the soldered surface while the measuring connector is being soldered to the PCB. In actual fabrication of the RF power divider, the silk 90 was marked with a circle 12mm diameter and a line thickness of 1mm. Thus, the substrate around the connector may tightly contact the heat sink of the high-power amplifier.

According to an aspect of the present invention, harmonic frequencies of the signal may be attenuated by 20dB or higher

in second and third order bands due to electrical characteristics of the circuit of the present invention. Therefore, wave quality is increased by suppressing second and third order harmonic frequencies of a radio signal.

The invention therefore achieves its stated objects, in that it provides an RF power divider advantageously enabling efficient use of amplifier space by implementing $\lambda/4$ lines with lumped elements and thus significantly reducing the length of the $\lambda/4$ lines. Furthermore, electrical characteristics of the RF power divider may be variably adjusted in conformity with external condition changes without reconstructing the RF power divider. Output signals thereof may easily be measured by providing a measuring connector on a substrate. The RF power divider of the present invention is suitable for incorporation into known UHF band amplifiers.

As will be readily appreciated by those skilled in the art, while the present invention has been described in detail with reference to specific embodiments, many variations can be made within the scope of the present invention. In particular, the central frequency of 325MHz, referred to in the above description, may be replaced with any RF frequency. Furthermore, the RF divider of the present invention may be realised using coaxial or other transmission lines in place of the microstrip lines discussed with reference to the particular embodiments described. The inductor coils may take any suitable form for an inductive component. In particular, they may not be air-cored but have adjustable ferrite cores, for example. They may take forms other than a coil.

Although circuits of the present invention have been described as RF power dividers, the same circuits may equally be used as RF power combiners, by simply reversing the roles of input port IP1 and output ports OP1-OP4. The term "RF power divider" used throughout this description, and in the

appended claims, should be interpreted accordingly.

CLAIMS

1. An RF power divider comprising:
- an input transmission line (10) having input and output ends;
- first and second quarter wavelength ($\lambda/4$) lines each having an input end connected to the output end of the input transmission line, and an output end;
- first and second output transmission lines (12, 14) each having an output end, and an input end connected to the output end of a respective one of first and second quarter wavelength lines; and
- a resistor (16) coupled between the respective input ends of the first and second output transmission lines;

in which the quarter wavelength lines are composed of inductor coils and capacitors, being lumped elements.

2. An RF power divider according to claim 1, the quarter wavelength lines comprising:
- first and second inductor coils (22, 24), each respectively coupled between the output side of the input transmission line, and the input side of a respective one of first and second output transmission lines;
- a first capacitor (34) coupled between a ground and the output side of the input transmission line; and
- a second capacitor (36) coupled in parallel with the resistor.

3. An RF power divider as claimed in claim 1, the quarter wavelength lines comprising:
- first and second inductor coils (22, 24), each having an input side coupled to the output side of the input transmission line, and an output side coupled to the input side of a respective one of first and second output transmission lines;
- a first capacitor (26) coupled between a ground and

the output side of the first coil;
- a second capacitor (28) coupled between the ground and the output side of the second coil;
- a third capacitor (30) coupled between the ground and the input side of the first output transmission line; and
- a fourth capacitor (32) coupled between the ground and the input side of the second output transmission line.

4. A four-output RF power divider comprising three RF power dividers according to claim 2 or claim 3, wherein first and second outputs of first RF power divider are each connected to an input of respective one of second and third RF power dividers.

5. A multiple-output RF power divider comprising at least two RF power dividers according to claims 2, 3 or 4.

6. An RF power divider according to claim 4 or claim 5 wherein:
- a first single transmission line performs the combined functions of the first output transmission line of the first RF power divider and the input transmission line of the second RF power divider; and
- a second single transmission line performs the combined functions of second output transmission line of the first RF power divider and the input transmission line of the third RF power divider.

7. An RF power divider as claimed in any of claims 1 to 6, wherein the coils are air-cored coils.

8. An RF power divider as claimed in any of claims 1 to 7, wherein the coils are adjustable.

9. An RF power divider as claimed in any of claims 1 to 8, wherein the transmission lines are microstrip lines.

10. An RF power divider as claimed in any of claims 1 to 8, wherein the transmission lines are coaxial lines.

11. An RF power divider as claimed in any of claims 1 to 10, further comprising an input port (IP1) connected to the input side of the input transmission line, and output ports (OP1-OP4) connected to output sides of respective output transmission lines.

12. An RF power divider as claimed in any of claims 1 to 11, further comprising measuring connectors for connecting measurement terminals of a measuring instrument.

13. An RF power divider as claimed in claim 12, wherein a silk is marked on a rear soldered surface of each measuring connector.

14. An RF power divider as claimed in claim 13, wherein the silk comprises a circle positioned so as to be centred on a connecting portion of a connected measurement terminal.

15. An RF power divider substantially as hereinbefore described, with reference to the drawings.

16. A UHF band high power amplifier incorporating an RF power divider according to any preceding claim.